Bt Corn Refuge Compliance Study 2001

Bt Corn Coalition Report

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Executive Summary

Bt Corn Market Overview

Bt corn hybrids were planted on 1.2 million acres in 2001 up 17.1% from 2000. Bt corn is grown by 59.6% of corn growers on 34.8% of the total corn acres.

Bt Corn Production by Province (2001 vs 2000)

	Ontario			Quebec			Manitoba			Total Market		
	2000	2001	Chg	2000	2001	Chg	2000	2001	Chg	2000	2001	Chg
% of Corn Growers	57.8	59.2	1.4	55.7	60.6	4.9	64.7	60.0	(4.7)	57.4	59.6	2.2
% of Total Corn Acres	33.3	36.1	2.8	29.5	33.4	3.9	27.4	27.3	(0.1)	31.7	34.8	3.1
Acres Planted (000's)	682	819	20.0%	328	385	17.2%	52	41	-21.4%	1,063	1,244	17.1%
Total Corn Acres (000's)	2,050	2,270	10.7%	1,112	1,153	3.7%	190	150	-21.1%	3,352	3,573	6.6%

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Awareness and Compliance with Bt Refuge Requirements			
Bt Refuge Management Requirements	% of Total Bt Growers		
	Aided Awareness	Compliance Stated	Actual
Plant 20% or more of corn acres to non-Bt corn	91.9	89.2	87.1
Plant Bt corn in the same field or within a 1/4 mile of non-Bt corn	86.0	86.4	90.4
Keep accurate records of where Bt Hybrids are planted	83.9	88.5	NA
Scout fields for corn borer damage	74.1	74.1	NA
Avoid using foliar insecticide sprays in adjacent non-Bt corn fields	58.1	69.5	NA

Summary of Findings

1. Aided awareness of the more important Bt refuge requirements is very high indicating the industry has done well at broadly communicating the requirements. Awareness is higher with larger farms and lower with smaller farms (Section 4).
2. Actual compliance to the 20% Bt refuge requirement is slightly lower than the stated compliance.
3. Actual compliance to the proximity requirement is slightly higher than the stated requirement.
4. Actual compliance levels to individual requirements are very high (87-94%), however, the compliance level with both the 20% refuge and proximity requirements is lower at 79% (Section 8).
5. Although there are no significant differences in compliance between provinces, there appears to be more of an issue with the proximity requirement in Manitoba. This is most likely related to large field sizes, crop rotations and the smaller role corn plays in overall cropping practices in Manitoba. (Section 8)
6. The majority of growers plant Bt corn and non-Bt corn in the same field (64%) followed by growers who plant non-Bt corn more than ¼ mile from Bt cornfields (46%). Only a small portion of Bt growers (9%) plant non-Bt corn more than ¼ mile from Bt corn. (Section 6)
7. Of the growers who plant non-Bt corn in the same field the majority of growers plant non-Bt corn in complete blocks or portions of the field (65%) followed by planting of headlands or perimeters of fields (30%) and alternating strips of 6 or more rows (18%). (Section 7)
8. The vast majority of Bt growers say they do not encounter any difficulties in meeting the refuge requirements. (Sections 9 & 10)
9. Approximately 3% of Bt growers say they can't be bothered to comply or believe it is not important to comply, however, this is significantly higher in Quebec (approx. 8%). (Sections 9 & 10)
10. Only 17% of Bt growers have suggestions for improvements. Of suggestions directly related to Bt Refuge requirements the most frequently mentioned suggestions are to ensure that Bt refuge requirements are maintained (18.9%) and to provide more

Bt Corn Refuge Management Overview

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Awareness and Compliance with Bt Refuge Requirements			
Bt Refuge Management Requirements	% of Total Bt Growers		
	Aided Awareness	Compliance Stated	Actual
Plant 20% or more of corn acres to non-Bt corn	91.9	89.2	87.1
Plant Bt corn in the same field or within a 1/4 mile of non-Bt corn	86.0	86.4	90.4
Keep accurate records of where Bt Hybrids are planted	83.9	88.5	NA
Scout fields for corn borer damage	74.1	74.1	NA
Avoid using foliar insecticide sprays in adjacent non-Bt corn fields	58.1	69.5	NA

Summary of Findings

1. Aided awareness of the more important Bt refuge requirements is very high indicating the industry has done well at broadly communicating the requirements. Awareness is higher with larger farms and lower with smaller farms (Section 4).
2. Actual compliance to the 20% Bt refuge requirement is slightly lower than the stated compliance.
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6. The majority of growers plant Bt corn and non-Bt corn in the same field (64%) followed by growers who plant non-Bt corn more than ¼ mile from Bt cornfields (46%). Only a small portion of Bt growers (9%) plant non-Bt corn more than ¼ mile from Bt corn. (Section 6)
7. Of the growers who plant non-Bt corn in the same field the majority of growers plant non-Bt corn in complete blocks or portions of the field (65%) followed by planting of headlands or perimeters of fields (30%) and alternating strips of 6 or more rows (18%). (Section 7)
8. The vast majority of Bt growers say they do not encounter any difficulties in meeting the refuge requirements. (Sections 9 & 10)
9. Approximately 3% of Bt growers say they can't be bothered to comply or believe it is not important to comply, however, this is significantly higher in Quebec (approx. 8%). (Sections 9 & 10)
10. Only 17% of Bt growers have suggestions for improvements. Of suggestions directly related to Bt Refuge requirements the most frequently mentioned suggestions are to ensure that Bt refuge requirements are maintained (18.9%) and to provide more

education or information (11.1%). (Section 11)

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Study Objectives and Methodology

Purpose & Objectives:

The purpose of this study is to assist the Canadian Corn Pest Coalition in understanding Bt corn grower's awareness, compliance and improvements needed in the implementation of the Bt refuge requirements that are being promoted by seed companies. This information will be used to comply with regulatory requirements and to assist the coalition and individual seed companies in improving their communication on refuge requirements. The study objectives are to:

1. Provide quantitative data on the overall level of grower awareness of refuge requirements.
2. Provide quantitative data on the level of grower compliance (both stated and actual) of refuge requirements in the overall market and by Seed Company.
3. Understand the barriers at the grower level in complying with the refuge requirements.
4. Seek grower's ideas for improving compliance and implementation of refuge requirements.
5. Categorize data by demographic profile (geography and corn acreage category)

Bt Refuge Requirements

1. The key requirements of the Bt Hybrid Insect Resistance Management (IRM) plan are as follows:
2. Plant 20% or more of total corn acres to non-Bt hybrids. (Herein referred to as the "20% Refuge Requirement").
3. Plant Bt cornfields adjacent to or within ¼ mile (400 meters) of non-Bt cornfields. (Herein referred to as the "Proximity Requirement").
4. Keep accurate records of where Bt and non-Bt hybrids are planted.
5. Scout Bt fields for corn borer damage and report problems to seed companies.
6. Avoid using foliar insecticide sprays in adjacent non-Bt fields.

Data Collection: Telephone interviews, averaging 21 minutes in length, were conducted with 1,737 corn growers during the period of July 2nd to July 31st. Two streams were set up. Stream 1 was a sample of 1,737 corn growers to determine acreage, demographic and company specific information. Stream 2 was a sub-set of Stream 1 with 1004 corn growers to ask questions specifically of the Bt refuge requirements. During the same interviews, respondents were asked questions concerning seed and herbicide usage in their corn.

Respondent Screening: Respondents were screened to ensure a) they were the individuals responsible for making crop input purchase decisions on their farm, and b) they grew at least 50 acres of corn in 2001.

Questionnaire Preparation & Testing: The phone questionnaire for this study employed

proven techniques used in previous studies conducted by Stratus Agri-Marketing Inc. The phone questionnaire was pre-tested with approximately 25 farmers on June 26th. Changes were identified and the final version of the phone questionnaire was programmed in CATI. All interviewers were fully trained prior to initiation of the study.

Sample Specifications and Completions: Data files containing the names, addresses and phone numbers of farmers were obtained from several clients. In addition, a listing of Manitoba corn growers was obtained from the Manitoba Corn Growers Association. These data files were merged and duplicates were removed. Quotas were established matching the population of corn growers in each Census Agricultural Region in Ontario and Quebec, in accordance with the 1996 Census of Agriculture.

The table on the next page summarizes phone completions.

Data Analysis: Dimark Research produced detailed tables, including frequency distributions and cross-tabulations.

Confidence Interval Estimation - Confidence intervals for each proportion were calculated using a standard market research convention by using a Normal Approximation to a Binomial Distribution at a 90% confidence interval. The extent to which the confidence interval overlapped was used to comment on apparent differences between proportions.

Corn Acreage Categories: Throughout this report references are made to corn acreage categories. They are defined as follows: "Small" size corn growers have corn acreages less than 128 acres. "Medium" corn growers have acres between 128 and 277 acres. "Large" size corn growers have corn acreage greater than 277 acres.

Corn	Universe		Corn Growers			Bt Stream 1			Bt Stream 2		
Province	# of Farms (50+ acres)	% of Farms	Target	Actual	% of Target	Target	Actual	% of Target	Target	Actual	% of Target
Quebec	4,776	26.3%	500	438	87.6%	210	250	119.0%	210	173	82.4%
Ontario	12,993	71.5%	1000	1264	126.4%	520	733	141.0%	520	334	64.2%
Manitoba*	400	2.2%	100	35	35.0%	-	21	-	-	21	-
TOTAL	18,169	100.0%	1600	1737	108.6%	730	1004	137.5%	730	528	72.3%

Bt Corn Information Received from each stream	Bt acreage	Bt refuge requirements: Awareness Stated compliance Proximity compliance Practices Difficulties Suggestions for improvement

Estimate only based on list supplied by Manitoba Corn Growers association

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Part A: Total Market Profile in 2001

1.Bt Corn Production by Province - 2001 vs. 2000

Bt Corn Production by Province (2001 vs 2000)												
	Ontario			Quebec			Manitoba			Total Market		
	2000	2001	Chg	2000	2001	Chg	2000	2001	Chg	2000	2001	Chg
% of Corn Growers	57.8	59.2	1.4	55.7	60.6	4.9	64.7	60.0	(4.7)	57.4	59.6	2.2
% of Total Corn Acres	33.3	36.1	2.8	29.5	33.4	3.9	27.4	27.3	(0.1)	31.7	34.8	3.1
Acres Planted (000's)	682	819	20.0%	328	385	17.2%	52	41	-21.4%	1,063	1,244	17.1%
Total Corn Acres (000's)	2,050	2,270	10.7%	1,112	1,153	3.7%	190	150	-21.1%	3,352	3,573	6.6%

Notes:

1. Total corn acres in 2000 by province includes both grain and silage and are based on "November Estimate of Production of Principal Field Crops, Canada, 2000" published by Statistics Canada - Field Crop Reporting Series, Vol. 79, No.8.
2. Total corn acres in 2001 by province include both grain and silage and are based on the June Estimate of Principal Field Crop Areas obtained from Statistics Canada.

The above table examines the use of Bt corn by province comparing 2000 and 2001. Corn growers were asked how many acres they planted to corn and specifically to Bt corn hybrids in 2001 and 2000. The % of growers and acres is calculated from the survey and the % of acres is applied to the corn acreage from Statistics Canada in both years to arrive at the Bt corn acreage.

Summary Observations:

- According to Statistics Canada corn acreage increased by 6.6%. A 10.7% increase in Ontario, 3.7% increase in Quebec and a decline of 21.1% in Manitoba.
- Bt corn was planted by 59.6% of corn growers in 2001 up from 57.4% in 2000.

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Summary Observations:

- According to Statistics Canada corn acreage increased by 6.6%. A 10.7% increase in Ontario, 3.7% increase in Quebec and a decline of 21.1% in Manitoba.
- Bt corn was planted by 59.6% of corn growers in 2001 up from 57.4% in 2000.

- The % of corn growers growing Bt corn was virtually the same in Ontario, Quebec and Manitoba in 2001.
- Bt corn hybrids accounted for 34.8% of total corn acres in 2001 up from 31.7% in 2000.
- Bt share of total corn acres is highest in Ontario (36.1%) followed by Quebec (33.4%) and Manitoba (27.3%).
- Total Bt corn acreage was over 1.2 million acres in 2001 up 17.1% from 2000 with the largest increases coming from Ontario (20.0%) and Quebec (17.2%). The Bt corn acres declined by 21.4% in Manitoba mainly due to a decline in the overall corn acres.

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2. Bt Corn Production by Corn Acreage Category - 2001 vs. 2000

Bt Corn Production by Corn Acreage Category (2001 vs 2000)												
	Small (< 128 acres)			Medium (128-277 acres)			Large (278 + acres)			Total Market		
	2000	2001	Chg	2000	2001	Chg	2000	2001	Chg	2000	2001	Chg
% of Corn Growers	49.1	49.8	0.7	63.5	66.4	2.9	69.1	74.7	5.6	57.4	59.6	2.2
% of Total Corn Acres	26.6	28.5	1.9	31.3	33.4	2.1	34.6	38.6	4.0	31.7	34.8	3.1
Acres Planted (000's)	204.5	212.7	4.0%	345.8	390.2	12.8%	512.3	641.4	25.2%	1,063	1,244	17.1%
Total Corn Acres (000's)	769	745	-3.0%	1,104	1,168	5.8%	1,480	1,660	12.1%	3,352	3,573	6.6%

Notes:

1. Total corn acres in 2000 includes grain and silage and is based on "November Estimate of Production of Principal Field Crops, Canada, 2000" published by Statistics Canada - Field Crop Reporting Series, Vol. 79, No.8. Acres by acreage category in 2000 are estimated from the Corn Herbicide Brand Usage & Image Study - 2000.
2. Total corn acres in 2001 include grain and silage and are based on "June Estimate of Principal Field Crop Areas" obtained from Statistics Canada. Acres by acreage category are estimated from the Corn Hybrid Brand Usage Study - 2001.

The above table examines the use of Bt corn by corn grower acreage category in 2000 and 2001. The corn acreage by category for 2000 is based on the Corn Herbicide Brand Usage and Image Study conducted by Stratus Agri-Marketing Inc. in 2000. The % change in corn acres by category reported in the 2001 Corn Hybrid Brand Usage Study and the Bt corn hybrid usage by category was used to estimate the Bt corn acreage by category in both 2001 and 2000.

Summary Observations:

- Corn acreage declined by 3.0% with small corn growers, however, increased by 5.8%

with medium size corn growers and 12.1% with large corn growers.

- Penetration of Bt corn is highest with large corn growers (74.7% of growers), followed by medium size corn growers (66.4%) and small corn growers (49.8%).
- Bt corn share of corn acres is also highest with large growers (38.6%), followed by medium size corn growers (33.4%) and small corn growers (28.5%).
- Large corn growers increased their share of corn acres with Bt corn by 4.0 share points, followed by medium size growers (2.1 share points) and small growers (1.9 share points).
- Acreage planted to Bt corn increased by approximately 25% with large corn growers, by 13% with medium size corn growers and 4% with small corn growers.

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3. Frequency of Multiple Bt Seed Company Use

Frequency of Multiple Bt Seed Company Use							
Base Size	Province				Corn Acreage		
	Total Market	ON	QC	MB	Small (< 128 acres)	Medium (128-277 acres)	Large (278 + acres)
	1004	733	250	21	439	296	269
# of Bt Corn Hybrid Co.							
One company	68.9	69.9	64.4	90.5	78.6	67.9	54.3
Two companies	25.7	25.4	28.0	9.5	19.4	26.7	34.9
Three companies	5.1	4.5	7.2	0.0	2.1	5.4	9.7
Four companies	0.3	0.3	0.4	0.0	0.0	0.0	1.1
Five or more companies	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The above table examines, separately by province and by corn acreage category, the extent to which Bt corn growers grow Bt corn hybrids from one or more seed corn companies. For example, in Ontario, of the 733 Bt corn growers from the survey, 69.9% grew Bt corn hybrids from one seed corn company, 25.4% from two companies, 4.5% from three companies and 0.3% from four companies.

Summary Observations:

- The majority of Bt corn growers (68.9%) grow Bt corn from one seed corn company, however, a significant portion (25.7%) grow Bt corn from two companies.
- Very few Bt corn growers (5.1%) grow corn from three or more companies.
- Quebec growers have a higher tendency to plant Bt corn from more than one company (35.6%) and Manitoba growers have a lower tendency to grow Bt corn from more than one company (9.5%).
- Larger corn growers have a tendency to plant Bt corn from more than one company (45.7%) than small corn growers (21.4%).

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- The % of corn growers growing Bt corn was virtually the same in Ontario, Quebec and Manitoba in 2001.
- Bt corn hybrids accounted for 34.8% of total corn acres in 2001 up from 31.7% in 2000.
- Bt share of total corn acres is highest in Ontario (36.1%) followed by Quebec (33.4%) and Manitoba (27.3%).
- Total Bt corn acreage was over 1.2 million acres in 2001 up 17.1% from 2000 with the largest increases coming from Ontario (20.0%) and Quebec (17.2%). The Bt corn acres declined by 21.4% in Manitoba mainly due to a decline in the overall corn acres.

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2. Bt Corn Production by Corn Acreage Category - 2001 vs. 2000

Bt Corn Production by Corn Acreage Category (2001 vs 2000)												
	Small (< 128 acres)			Medium (128-277 acres)			Large (278 + acres)			Total Market		
	2000	2001	Chg	2000	2001	Chg	2000	2001	Chg	2000	2001	Chg
% of Corn Growers	49.1	49.8	0.7	63.5	66.4	2.9	69.1	74.7	5.6	57.4	59.6	2.2
% of Total Corn Acres	26.6	28.5	1.9	31.3	33.4	2.1	34.6	38.6	4.0	31.7	34.8	3.1
Acres Planted (000's)	204.5	212.7	4.0%	345.8	390.2	12.8%	512.3	641.4	25.2%	1,063	1,244	17.1%
Total Corn Acres (000's)	769	745	-3.0%	1,104	1,168	5.8%	1,480	1,660	12.1%	3,352	3,573	6.6%

Notes:

1. Total corn acres in 2000 includes grain and silage and is based on "November Estimate of Production of Principal Field Crops, Canada, 2000" published by Statistics Canada - Field Crop Reporting Series, Vol. 79, No.8. Acres by acreage category in 2000 are estimated from the Corn Herbicide Brand Usage & Image Study - 2000.
2. Total corn acres in 2001 include grain and silage and are based on "June Estimate of Principal Field Crop Areas" obtained from Statistics Canada. Acres by acreage category are estimated from the Corn Hybrid Brand Usage Study - 2001.

The above table examines the use of Bt corn by corn grower acreage category in 2000 and 2001. The corn acreage by category for 2000 is based on the Corn Herbicide Brand Usage and Image Study conducted by Stratus Agri-Marketing Inc. in 2000. The % change in corn acres by category reported in the 2001 Corn Hybrid Brand Usage Study and the Bt corn hybrid usage by category was used to estimate the Bt corn acreage by category in both 2001 and 2000.

Summary Observations:

- Corn acreage declined by 3.0% with small corn growers, however, increased by 5.8%

with medium size corn growers and 12.1% with large corn growers.

- Penetration of Bt corn is highest with large corn growers (74.7% of growers), followed by medium size corn growers (66.4%) and small corn growers (49.8%).
- Bt corn share of corn acres is also highest with large growers (38.6%), followed by medium size corn growers (33.4%) and small corn growers (28.5%).
- Large corn growers increased their share of corn acres with Bt corn by 4.0 share points, followed by medium size growers (2.1 share points) and small growers (1.9 share points).
- Acreage planted to Bt corn increased by approximately 25% with large corn growers, by 13% with medium size corn growers and 4% with small corn growers.

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3. Frequency of Multiple Bt Seed Company Use

Frequency of Multiple Bt Seed Company Use							
Base Size	Province				Corn Acreage		
	Total Market	ON	QC	MB	Small (< 128 acres)	Medium (128-277 acres)	Large (278 + acres)
	1004	733	250	21	439	296	269
# of Bt Corn Hybrid Co.							
One company	68.9	69.9	64.4	90.5	78.6	67.9	54.3
Two companies	25.7	25.4	28.0	9.5	19.4	26.7	34.9
Three companies	5.1	4.5	7.2	0.0	2.1	5.4	9.7
Four companies	0.3	0.3	0.4	0.0	0.0	0.0	1.1
Five or more companies	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The above table examines, separately by province and by corn acreage category, the extent to which Bt corn growers grow Bt corn hybrids from one or more seed corn companies. For example, in Ontario, of the 733 Bt corn growers from the survey, 69.9% grew Bt corn hybrids from one seed corn company, 25.4% from two companies, 4.5% from three companies and 0.3% from four companies.

Summary Observations:

- The majority of Bt corn growers (68.9%) grow Bt corn from one seed corn company, however, a significant portion (25.7%) grow Bt corn from two companies.
- Very few Bt corn growers (5.1%) grow corn from three or more companies.
- Quebec growers have a higher tendency to plant Bt corn from more than one company (35.6%) and Manitoba growers have a lower tendency to grow Bt corn from more than one company (9.5%).
- Larger corn growers have a tendency to plant Bt corn from more than one company (45.7%) than small corn growers (21.4%).

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Part B: Awareness, Practices and Compliance with Bt Corn Refuge Requirements

4. Aided Awareness of Bt Corn Refuge Requirements

Aided Awarness of Bt Refuge Requirements by Province				
Bt Refuge Management Requirements	% of Bt Growers			
	Total	Ontario	Quebec	Manitoba
Base	528	334	173	21
Plant 20% or more of corn acres to non-Bt corn	91.9	91.3	92.5	95.2
Plant Bt corn in the same field or within a 1/4 mile of non-Bt corn	86.0	87.1	82.7	95.2
Scout fields for corn borer damage	74.1	72.8	76.3	76.2
Avoid using foliar insecticide sprays in adjacent non-Bt corn fields	58.1	54.8	62.4	76.2
Keep accurate records of where Bt Hybrids are planted	83.9	84.1	83.2	85.7

Aided Awareness of Bt Refuge Requirments by Corn Acreage Size				
Bt Refuge Management Requirements	% of Bt Growers			
	Total	Small	Medium	Large
Base	528	267	152	109
Plant 20% or more of corn acres to non-Bt corn	91.9	91.8	90.8	93.6
Plant Bt corn in the same field or within a 1/4 mile of non-Bt corn	86.0	86.5	83.6	88.1
Scout fields for corn borer damage	74.1	68.9	77.0	82.6
Avoid using foliar insecticide sprays in adjacent non-Bt corn fields	58.1	53.2	61.2	66.1
Keep accurate records of where Bt Hybrids are planted	83.9	81.3	85.5	88.1

The above tables examine the aided awareness of the Bt refuge management requirements among Bt corn growers split by province and by corn acreage category. Bt corn growers were read each requirement and asked if they were aware of each requirement. Differences between rows that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- On an aided basis there is generally very high awareness of the 20% Bt refugia area requirement (91.9%), the proximity requirement (86.0%) and keeping accurate records of Bt corn hybrid plantings (83.9%
- The awareness to scout fields for corn borer damage is somewhat weaker at 74.1% but

still quite high

- Awareness of avoiding use of insecticide sprays in adjacent non-Bt cornfields is much weaker (58.1%), however, in Manitoba were it is most relevant awareness is much higher (76.2%). Awareness in Ontario and Quebec is expected to be much lower because foliar insecticides are not normally used in field corn.

By Province:

- Awareness of the proximity requirement and avoiding the use of insecticide sprays in adjacent non-Bt cornfields is significantly higher in Manitoba
- No other differences based on provincial splits are significant.

By Corn Acreage Category:

- Larger corn growers have a higher awareness of the requirements for scouting and avoiding insecticide spraying than do smaller growers.
- No other differences based on the size of corn grower are significant.

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5. Stated Compliance Levels

Stated Compliance with Bt Refuge Requirements by Province				
Bt Refuge Management Requirements	% of Bt Growers Meeting Requirement			
	Total	Ontario	Quebec	Manitoba
Base	528	334	173	21
Plant 20% or more of corn acres to non-Bt corn	89.2	90.1	87.9	85.7
Plant Bt corn in the same field or within a 1/4 mile of non-Bt corn	86.4	89.8	79.8	85.7
Will scout fields for corn borer damage	74.1	74.3	75.1	61.9
Avoid using foliar insecticide sprays in adjacent non-Bt corn fields	69.5	71.9	63.6	81.0
Keep accurate records of where Bt Hybrids are planted	88.5	91.0	84.4	81.0

Part B: Awareness, Practices and Compliance with Bt Corn Refuge Requirements

4. Aided Awareness of Bt Corn Refuge Requirements

Aided Awarness of Bt Refuge Requirements by Province				
Bt Refuge Management Requirements	% of Bt Growers			
	Total	Ontario	Quebec	Manitoba
Base	528	334	173	21
Plant 20% or more of corn acres to non-Bt corn	91.9	91.3	92.5	95.2
Plant Bt corn in the same field or within a 1/4 mile of non-Bt corn	86.0	87.1	82.7	95.2
Scout fields for corn borer damage	74.1	72.8	76.3	76.2
Avoid using foliar insecticide sprays in adjacent non-Bt corn fields	58.1	54.8	62.4	76.2
Keep accurate records of where Bt Hybrids are planted	83.9	84.1	83.2	85.7

Aided Awareness of Bt Refuge Requirments by Corn Acreage Size				
Bt Refuge Management Requirements	% of Bt Growers			
	Total	Small	Medium	Large
Base	528	267	152	109
Plant 20% or more of corn acres to non-Bt corn	91.9	91.8	90.8	93.6
Plant Bt corn in the same field or within a 1/4 mile of non-Bt corn	86.0	86.5	83.6	88.1
Scout fields for corn borer damage	74.1	68.9	77.0	82.6
Avoid using foliar insecticide sprays in adjacent non-Bt corn fields	58.1	53.2	61.2	66.1
Keep accurate records of where Bt Hybrids are planted	83.9	81.3	85.5	88.1

The above tables examine the aided awareness of the Bt refuge management requirements among Bt corn growers split by province and by corn acreage category. Bt corn growers were read each requirement and asked if they were aware of each requirement. Differences between rows that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- On an aided basis there is generally very high awareness of the 20% Bt refugia area requirement (91.9%), the proximity requirement (86.0%) and keeping accurate records of Bt corn hybrid plantings (83.9%
- The awareness to scout fields for corn borer damage is somewhat weaker at 74.1% but

still quite high

- Awareness of avoiding use of insecticide sprays in adjacent non-Bt cornfields is much weaker (58.1%), however, in Manitoba were it is most relevant awareness is much higher (76.2%). Awareness in Ontario and Quebec is expected to be much lower because foliar insecticides are not normally used in field corn.

By Province:

- Awareness of the proximity requirement and avoiding the use of insecticide sprays in adjacent non-Bt cornfields is significantly higher in Manitoba
- No other differences based on provincial splits are significant.

By Corn Acreage Category:

- Larger corn growers have a higher awareness of the requirements for scouting and avoiding insecticide spraying than dc smaller growers.
- No other differences based on the size of corn grower are significant.

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5. Stated Compliance Levels

Stated Compliance with Bt Refuge Requirements by Province				
Bt Refuge Management Requirements	% of Bt Growers Meeting Requirement			
	Total	Ontario	Quebec	Manitoba
Base	528	334	173	21
Plant 20% or more of corn acres to non-Bt corn	89.2	90.1	87.9	85.7
Plant Bt corn in the same field or within a 1/4 mile of non-Bt corn	86.4	89.8	79.8	85.7
Will scout fields for corn borer damage	74.1	74.3	75.1	61.9
Avoid using foliar insecticide sprays in adjacent non-Bt corn fields	69.5	71.9	63.6	81.0
Keep accurate records of where Bt Hybrids are planted	88.5	91.0	84.4	81.0

Stated Compliance with Bt Refuge Requirements by Corn Acreage Size				
Bt Refuge Management Requirements	% of Bt Growers Meeting Requirement			
	Total	Small	Medium	Large
Base	528	267	152	109
Plant 20% or more of corn acres to non-Bt corn	89.2	90.3	89.5	86.2
Plant Bt corn in the same field or within a 1/4 mile of non-Bt corn	86.4	87.6	84.2	86.2
Will scout fields for corn borer damage	74.1	69.7	76.3	81.7
Avoid using foliar insecticide sprays in adjacent non-Bt corn fields	69.5	65.5	75.7	70.6
Keep accurate records of where Bt Hybrids are planted	88.5	86.1	89.5	92.7

The above table examines the compliance to the Bt corn insect management requirements as stated by growers growing Bt corn split by province and corn acreage category. Each requirement was read to growers and they were asked whether they would meet this requirement in 2001. Differences between rows that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- Stated compliance to the five requirements to manage insect resistance to Bt corn hybrids is in the high 80% levels for each requirement with the exception of intention to scout fields for corn borer damage at 74.1% and avoiding use of foliar insecticides in adjacent fields at 69.5%.
- Stated compliance to keeping a 20% non-Bt corn refuge is almost identical to the actual compliance based on Bt and non-Bt corn acreage provide by growers. From Section 8, 87.1% of Bt corn growers met the requirement versus 89.2% who say they do.
- Stated compliance with the proximity requirement (Plant Bt corn in the same field or within a 1/4 mile of non-Bt corn) is lower than the actual compliance based on answers to questioning on planting practices. From Section 8, 90.4% of Bt corn growers are planting non-Bt corn in the same field or within a ¼ mile of Bt cornfields versus 86.4% who say they do.

By Province:

- Stated compliance with the proximity requirement is significantly higher in Ontario then in Quebec. This follows the same trend based on actual compliance differences between Ontario and Quebec from Section 8.
- No other difference between provinces is significant.

By Corn Acreage Category:

- Large corn growers are more likely to say they meet the requirement to scout fields for

corn borer damage than small corn growers.
- No other differences based on the size of corn grower are significant.

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6. Proximity of Bt Corn to Non-Bt Corn

Proximity of Bt Corn to Non-Bt Corn by Province				
Proximity of Bt Corn to Non-Bt Corn	% of Bt Growers			
	Total	Ontario	Quebec	Manitoba
Base	528	334	173	21
In Same Field	63.8	73.4	42.8	85.7
1/4 Mile or Less	45.6	45.2	49.1	23.8
Greater than 1/4 Mile	9.3	9.3	8.1	19.1
Don't Know	3.6	1.5	8.1	0.0
Compliance Level (excludes DK from base)	90.4	90.6	91.2	81.0

Proximity of Bt Corn to Non-Bt Corn by Corn Acreage				
Proximity of Bt Corn to Non-Bt Corn	% of Bt Growers			
	Total	Small	Medium	Large
Base	528	267	152	109
In Same Field	63.8	67.4	62.5	56.9
1/4 Mile or Less	45.6	43.1	51.3	44.0
Greater than 1/4 Mile	9.3	8.2	9.9	11.0
Don't Know	3.6	2.6	3.3	6.4
Compliance Level (excludes DK from base)	90.4	91.5	89.8	88.2

The above tables examine the planting practices of Bt corn growers with respect to the proximity of their Bt corn to their non-Bt corn split by province and corn acreage category. The table shows the proportion of Bt corn growers by province that a) grow non-Bt corn in the same field as Bt corn b) grow their non-Bt corn within a ¼ mile of their Bt corn and c) grow their non-Bt corn greater than ¼ mile from their Bt corn. Growers could indicate more than one practice. The overall compliance level on the proximity requirement is calculated with "Don't Know" excluded from the base. Differences between rows that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- A majority of Bt corn growers plant non-Bt corn in the same field (63.8%).
- 45.6% of Bt growers plant non-Bt corn in fields within ¼ mile of their Bt cornfields.

Stated Compliance with Bt Refuge Requirements by Corn Acreage Size				
Bt Refuge Management Requirements	% of Bt Growers Meeting Requirement			
	Total	Small	Medium	Large
Base	528	287	152	109
Plant 20% or more of corn acres to non-Bt corn	89.2	90.3	89.5	86.2
Plant Bt corn in the same field or within a 1/4 mile of non-Bt corn	86.4	87.6	84.2	86.2
Will scout fields for corn borer damage	74.1	69.7	76.3	81.7
Avoid using foliar insecticide sprays in adjacent non-Bt corn fields	69.5	65.5	75.7	70.6
Keep accurate records of where Bt Hybrids are planted	88.5	86.1	89.5	92.7

The above table examines the compliance to the Bt corn insect management requirements as stated by growers growing Bt corn split by province and corn acreage category. Each requirement was read to growers and they were asked whether they would meet this requirement in 2001. Differences between rows that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- Stated compliance to the five requirements to manage insect resistance to Bt corn hybrids is in the high 80% levels for each requirement with the exception of intention to scout fields for corn borer damage at 74.1% and avoiding use of foliar insecticides in adjacent fields at 69.5%.
- Stated compliance to keeping a 20% non-Bt corn refuge is almost identical to the actual compliance based on Bt and non-Bt corn acreage provide by growers. From Section 8, 87.1% of Bt corn growers met the requirement versus 89.2% who say they do.
- Stated compliance with the proximity requirement (Plant Bt corn in the same field or within a 1/4 mile of non-Bt corn) is lower than the actual compliance based on answers to questioning on planting practices. From Section 8, 90.4% of Bt corn growers are planting non-Bt corn in the same field or within a ¼ mile of Bt cornfields versus 86.4% who say they do.

By Province:

- Stated compliance with the proximity requirement is significantly higher in Ontario then in Quebec. This follows the same trend based on actual compliance differences between Ontario and Quebec from Section 8.
- No other difference between provinces is significant.

By Corn Acreage Category:

- Large corn growers are more likely to say they meet the requirement to scout fields for

corn borer damage than small corn growers.
- No other differences based on the size of corn grower are significant.

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6. Proximity of Bt Corn to Non-Bt Corn

Proximity of Bt Corn to Non-Bt Corn by Province				
Proximity of Bt Corn to Non-Bt Corn	% of Bt Growers			
	Total	Ontario	Quebec	Manitoba
Base	528	334	173	21
In Same Field	63.8	73.4	42.8	85.7
1/4 Mile or Less	45.6	45.2	49.1	23.8
Greater than 1/4 Mile	9.3	9.3	8.1	19.1
Don't Know	3.6	1.5	8.1	0.0
Compliance Level (excludes DK from base)	90.4	90.6	91.2	81.0

Proximity of Bt Corn to Non-Bt Corn by Corn Acreage				
Proximity of Bt Corn to Non-Bt Corn	% of Bt Growers			
	Total	Small	Medium	Large
Base	528	267	152	109
In Same Field	63.8	67.4	62.5	56.9
1/4 Mile or Less	45.6	43.1	51.3	44.0
Greater than 1/4 Mile	9.3	8.2	9.9	11.0
Don't Know	3.6	2.6	3.3	6.4
Compliance Level (excludes DK from base)	90.4	91.5	89.8	88.2

The above tables examine the planting practices of Bt corn growers with respect to the proximity of their Bt corn to their non-Bt corn split by province and corn acreage category. The table shows the proportion of Bt corn growers by province that a) grow non-Bt corn in the same field as Bt corn b) grow their non-Bt corn within a ¼ mile of their Bt corn and c) grow their non-Bt corn greater than ¼ mile from their Bt corn. Growers could indicate more than one practice. The overall compliance level on the proximity requirement is calculated with "Don't Know" excluded from the base. Differences between rows that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- A majority of Bt corn growers plant non-Bt corn in the same field (63.8%).
- 45.6% of Bt growers plant non-Bt corn in fields within ¼ mile of their Bt cornfields.

- 12.8% of corn growers either don't know or plant non-Bt corn greater than ¼ mile from their Bt cornfields.
- 90.4% of Bt corn growers appear to comply with the proximity requirement.

By Province:

- Quebec growers less frequently plant Bt and non-Bt in the same field than do Bt corn growers in Ontario or Manitoba.
- Manitoba growers appear to be less likely to comply with the proximity requirement. Instead of planting non-Bt corn within ¼ mile of Bt cornfields they appear to be either not meeting the requirement or planting within the same field. This could be due to the much larger field sizes in Manitoba. This combined with the necessity for crop rotations could make it more difficult to manage the distance between Bt and non-Bt cornfields.

By Corn Acreage Category:

- No significant differences based on the size of corn grower are evident.

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7. Refuge Planting Practices In Same Field

Refuge Planting Practices in Same Field by Province				
Planting Practice	% of Bt Growers with Bt and non-Bt in Same Field			
	Total	Ontario	Quebec	Manitoba
Base	500	323	158	19
Seed Mixed Together	3.8	2.2	7.6	0.0
Alternating Strip of Less than 6 rows	12.6	12.1	13.3	15.8
Less than Recommended Guidelines	15.6	14.2	18.4	15.8
Alternating Strips of 6 or More rows	18.0	16.7	20.9	15.8
Complete Blocks of Portions of Fields	65.0	64.7	64.6	73.7
Headlands or Perimeter of Fields	29.6	36.5	13.3	47.4
Meets or Exceeds Recommended Guidelines	89.8	91.3	86.7	89.5

Refuge Planting Practices in Same Field by Corn Acreage				
Planting Practice	% of Bt Growers with Bt and non-Bt in Same Field			
	Total	Small	Medium	Large
Base	500	251	149	100
Seed Mixed Together	3.8	4.4	3.4	3.0
Alternating Strip of Less than 6 rows	12.6	11.6	14.8	12.0
Less than Recommended Guidelines	15.6	14.7	18.1	14.0
Alternating Strips of 6 or More rows	18.0	14.3	18.8	26.0
Complete Blocks of Portions of Fields	65.0	61.8	69.1	67.0
Headlands or Perimeter of Fields	29.6	32.7	26.9	26.0
Meets or Exceeds Recommended Guidelines	89.8	89.2	89.3	92.0

The above table examines the planting practices of Bt growers in regards to planting non-Bt corn in the same field as their Bt corn split by province and corn acreage category. Growers were asked whether they a) mixed their non-Bt and Bt corn seed together b) planted in alternating strips of less than 6 rows c) planted in alternating strips of 6 or more rows d) planted complete blocks or portions of their field to non-Bt corn or e) planted headlands or the perimeter of fields to non-Bt corn. Growers could indicate multiple mentions. Differences between rows that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- 89.8% of Bt growers plant Bt corn and non-Bt corn in the same fields in such a way that follows the recommended guidelines.
- The most popular method is to plant non-Bt corn in complete blocks or portions of the field (65.0%) followed by planting of headlands or perimeters of the field (29.6%).
- 18% of Bt growers plant in alternating strips of 6 or more rows.
- 15.6% of Bt corn growers plant Bt and non-Bt corn in the same field in a way that does not meet the planting guidelines for Bt corn refuge. The most common method among these growers is to plant in alternating strips of less than 6 rows.

By Province:

- A significantly higher proportion of Quebec growers mix their Bt and non-Bt seed together.
- Significantly fewer Quebec growers plant headlands or perimeters of Bt cornfields with non-Bt corn.
- No other differences are significant.

By Corn Acreage Category:

- Larger corn growers prefer to plant in alternating strips of 6 or more rows than do smaller corn growers.
- No other differences based on the size of corn grower are significant.

- 12.8% of corn growers either don't know or plant non-Bt corn greater than ¼ mile from their Bt cornfields.
- 90.4% of Bt corn growers appear to comply with the proximity requirement.

By Province:

- Quebec growers less frequently plant Bt and non-Bt in the same field than do Bt corn growers in Ontario or Manitoba.
- Manitoba growers appear to be less likely to comply with the proximity requirement. Instead of planting non-Bt corn within ¼ mile of Bt cornfields they appear to be either not meeting the requirement or planting within the same field. This could be due to the much larger field sizes in Manitoba. This combined with the necessity for crop rotations could make it more difficult to manage the distance between Bt and non-Bt cornfields.

By Corn Acreage Category:

- No significant differences based on the size of corn grower are evident.

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7. Refuge Planting Practices In Same Field

Refuge Planting Practices in Same Field by Province				
Planting Practice	% of Bt Growers with Bt and non-Bt in Same Field			
	Total	Ontario	Quebec	Manitoba
Base	500	323	158	19
Seed Mixed Together	3.8	2.2	7.6	0.0
Alternating Strip of Less than 6 rows	12.6	12.1	13.3	15.8
Less than Recommended Guidelines	15.6	14.2	18.4	15.8
Alternating Strips of 6 or More rows	18.0	16.7	20.9	15.8
Complete Blocks of Portions of Fields	65.0	64.7	64.6	73.7
Headlands or Perimeter of Fields	29.6	36.5	13.3	47.4
Meets or Exceeds Recommended Guidelines	89.8	91.3	86.7	89.5

Refuge Planting Practices in Same Field by Corn Acreage				
Planting Practice	% of Bt Growers with Bt and non-Bt in Same Field			
	Total	Small	Medium	Large
Base	500	251	149	100
Seed Mixed Together	3.8	4.4	3.4	3.0
Alternating Strip of Less than 6 rows	12.6	11.6	14.8	12.0
Less than Recommended Guidelines	15.6	14.7	18.1	14.0
Alternating Strips of 6 or More rows	18.0	14.3	18.8	26.0
Complete Blocks of Portions of Fields	65.0	61.8	69.1	67.0
Headlands or Perimeter of Fields	29.6	32.7	26.9	26.0
Meets or Exceeds Recommended Guidelines	89.8	89.2	89.3	92.0

The above table examines the planting practices of Bt growers in regards to planting non-Bt corn in the same field as their Bt corn split by province and corn acreage category. Growers were asked whether they a) mixed their non-Bt and Bt corn seed together b) planted in alternating strips of less than 6 rows c) planted in alternating strips of 6 or more rows d) planted complete blocks or portions of their field to non-Bt corn or e) planted headlands or the perimeter of fields to non-Bt corn. Growers could indicate multiple mentions. Differences between rows that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- 89.8% of Bt growers plant Bt corn and non-Bt corn in the same fields in such a way that follows the recommended guidelines.
- The most popular method is to plant non-Bt corn in complete blocks or portions of the field (65.0%) followed by planting of headlands or perimeters of the field (29.6%).
- 18% of Bt growers plant in alternating strips of 6 or more rows.
- 15.6% of Bt corn growers plant Bt and non-Bt corn in the same field in a way that does not meet the planting guidelines for Bt corn refuge. The most common method among these growers is to plant in alternating strips of less than 6 rows.

By Province:

- A significantly higher proportion of Quebec growers mix their Bt and non-Bt seed together.
- Significantly fewer Quebec growers plant headlands or perimeters of Bt cornfields with non-Bt corn.
- No other differences are significant.

By Corn Acreage Category:

- Larger corn growers prefer to plant in alternating strips of 6 or more rows than do smaller corn growers.
- No other differences based on the size of corn grower are significant.

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8. Overall Compliance Levels

Overall Actual Compliance with Bt Refuge Requirements by Province				
Actual Bt Refuge Compliance Base	**% of Bt Growers**			
	Total	**Ontario**	**Quebec**	**Manitoba**
Base - 20% Refuge	528	334	173	21
Base - Proximity (excludes DK)	509	329	159	21
Complied with 20% Refuge Requirement	87.1	85.9	89.6	85.7
Complied with Proximity Requirement	90.4	90.6	91.2	81.0
Complied with Both Requirements	79.0	78.1	81.8	71.4
Non- Compliance with 20% Refuge Requirement	12.9	14.1	10.4	14.3
Non-Compliance with Proximity Requirement	9.6	9.4	8.8	19.0
Non-Compliance with Either Requirement	21.0	21.9	18.2	28.6

Overall Actual Compliance with Bt Refuge Requirements by Corn Acreage				
Actual Bt Refuge Compliance Base	**% of Bt Growers**			
	Total	**Small**	**Medium**	**Large**
Base - 20% Refuge	528	267	152	109
Base - Proximity (excludes DK)	509	260	147	102
Complied with 20% Refuge Requirement	87.1	86.1	87.5	89.0
Complied with Proximity Requirement	90.4	91.5	89.8	88.2
Complied with Both Requirements	79.0	80.0	77.6	78.4
Non- Compliance with 20% Refuge Requirement	12.9	13.9	12.5	11.0
Non-Compliance with Proximity Requirement	9.6	8.5	10.2	11.8
Non-Compliance with Either Requirement	21.0	20.0	22.4	21.6

The above table examines the overall compliance levels to the 20% refuge requirement and the proximity requirement split by province and corn acreage category. To comply with the 20% refuge requirement the proportion of non-Bt corn to Bt corn as determined by the acreages that farmers reported had to be 20% or more. To comply with the proximity requirement non-Bt corn had to be planted within ¼ mile of Bt cornfields. Don't know responses from Section 6 were excluded from the base in calculating compliance and non-compliance to the proximity and combined proximity/20% refuge requirements. Differences between rows that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- 87.1% of Bt growers meet the 20% refuge requirement.
- A higher proportion of Bt corn growers (90.4%) met the proximity requirement.
- Overall compliance with both the 20% refuge and proximity requirements was 79.0%.

By Province:

- There are no significant differences in compliance levels between provinces, however, compliance with the proximity requirement appears somewhat lower in Manitoba.

By Corn Acreage Category:

- No significant differences based on the size of corn grower are evident.

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Part C: Barriers To Compliance and Suggestions to Improve Bt Refuge Management

9. Difficulties In Meeting 20% Refuge Requirement

Difficulties in Meeting 20% Refuge Requirement - By Province				
Difficulties	% of Bt Growers			
	Total	Ontario	Quebec	Manitoba
Base	505	317	167	21
No difficulty	85.4	89.6	77.3	85.7
Hassle switching seed during planting	3.4	2.5	4.2	9.5
Can't be bothered/not important	3.2	1.0	7.8	0.0
Difficult to keep track of	2.8	1.9	3.6	9.5
Fields too small	2.8	1.9	4.2	4.8
Want to plant more BT corn	1.6	1.6	1.8	0.0
Ran out of non-BT corn seed	0.8	1.3	0.0	0.0
Fields too far apart	0.4	0.3	0.6	0.0
Hassle switching herbicides	0.4	0.3	0.6	0.0
Fields too large	0.2	0.0	0.6	0.0

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8. Overall Compliance Levels

Overall Actual Compliance with Bt Refuge Requirements by Province				
Actual Bt Refuge Compliance Base	% of Bt Growers			
	Total	Ontario	Quebec	Manitoba
Base - 20% Refuge	528	334	173	21
Base - Proximity (excludes DK)	509	329	159	21
Complied with 20% Refuge Requirement	87.1	85.9	89.6	85.7
Complied with Proximity Requirement	90.4	90.6	91.2	81.0
Complied with Both Requirements	79.0	78.1	81.8	71.4
Non- Compliance with 20% Refuge Requirement	12.9	14.1	10.4	14.3
Non-Compliance with Proximity Requirement	9.6	9.4	8.8	19.0
Non-Compliance with Either Requirement	21.0	21.9	18.2	28.6

Overall Actual Compliance with Bt Refuge Requirements by Corn Acreage				
Actual Bt Refuge Compliance Base	% of Bt Growers			
	Total	Small	Medium	Large
Base - 20% Refuge	528	267	152	109
Base - Proximity (excludes DK)	509	260	147	102
Complied with 20% Refuge Requirement	87.1	86.1	87.5	89.0
Complied with Proximity Requirement	90.4	91.5	89.8	88.2
Complied with Both Requirements	79.0	80.0	77.6	78.4
Non- Compliance with 20% Refuge Requirement	12.9	13.9	12.5	11.0
Non-Compliance with Proximity Requirement	9.6	8.5	10.2	11.8
Non-Compliance with Either Requirement	21.0	20.0	22.4	21.6

The above table examines the overall compliance levels to the 20% refuge requirement and the proximity requirement split by province and corn acreage category. To comply with the 20% refuge requirement the proportion of non-Bt corn to Bt corn as determined by the acreages that farmers reported had to be 20% or more. To comply with the proximity requirement non-Bt corn had to be planted within ¼ mile of Bt cornfields. Don't know responses from Section 6 were excluded from the base in calculating compliance and non-compliance to the proximity and combined proximity/20% refuge requirements. Differences between rows that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- 87.1% of Bt growers meet the 20% refuge requirement.
- A higher proportion of Bt corn growers (90.4%) met the proximity requirement.
- Overall compliance with both the 20% refuge and proximity requirements was 79.0%.

By Province:

- There are no significant differences in compliance levels between provinces, however, compliance with the proximity requirement appears somewhat lower in Manitoba.

By Corn Acreage Category:

- No significant differences based on the size of corn grower are evident.

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Part C: Barriers To Compliance and Suggestions to Improve Bt Refuge Management

9. Difficulties In Meeting 20% Refuge Requirement

Difficulties In Meeting 20% Refuge Requirement - By Province				
Difficulties	% of Bt Growers			
	Total	Ontario	Quebec	Manitoba
Base	505	317	167	21
No difficulty	85.4	89.6	77.3	85.7
Hassle switching seed during planting	3.4	2.5	4.2	9.5
Can't be bothered/not important	3.2	1.0	7.8	0.0
Difficult to keep track of	2.8	1.9	3.6	9.5
Fields too small	2.8	1.9	4.2	4.8
Want to plant more BT corn	1.6	1.6	1.8	0.0
Ran out of non-BT corn seed	0.8	1.3	0.0	0.0
Fields too far apart	0.4	0.3	0.6	0.0
Hassle switching herbicides	0.4	0.3	0.6	0.0
Fields too large	0.2	0.0	0.6	0.0

Difficulties in Meeting 20% Refuge Requirement - By Corn Acreage				
Difficulties	% of Bt Growers			
	Total	Small	Medium	Large
Base	505	261	141	103
No difficulty	85.4	84.7	85.8	86.4
Hassle switching seed during planting	3.4	3.5	3.6	2.9
Can't be bothered/not important	3.2	3.8	0.7	4.9
Difficult to keep track of	2.8	1.9	5.7	1.0
Fields too small	2.8	3.1	2.8	1.9
Want to plant more BT corn	1.6	1.9	1.4	1.0
Ran out of non-BT corn seed	0.8	1.2	0.7	0.0
Fields too far apart	0.4	0.4	0.7	0.0
Hassle switching herbicides	0.4	0.4	0.0	1.0
Fields too large	0.2	0.0	0.0	1.0

The above tables examine the difficulties Bt corn growers are having in meeting the 20% refuge requirement split by province and corn acreage category. Bt corn growers were asked an open-ended question on what difficulties they had in meeting the requirement to plant at least 20% of their corn acres to non-Bt corn. Responses are summarized in the table and listed in order of most frequently mentioned. Differences between rows that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- 85.4% of Bt growers say they have no difficulties in meeting the 20% refuge requirements.
- Although only a low proportion of Bt growers mentioned difficulties, the most frequent mentions were hassle switching seed during planting, can't be bothered or consider the requirement unimportant, find it difficult to keep track of and fields being too small.

By Province:

- A significantly higher proportion of Bt growers in Ontario had mentioned no difficulties in meeting the 20% refuge requirement.
- A significantly higher proportion of Bt growers in Quebec said meeting the requirement was unimportant or they could not be bothered meeting it.

By Corn Acreage Category:

- No significant differences based on the size of corn grower are evident.

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10. Difficulties in Meeting Proximity Requirement

Difficulties in Meeting Proximity Requirement - By Province				
Difficulties	% of Bt Growers			
	Total	Ontario	Quebec	Manitoba
Base	503	320	163	20
No difficulty	86.7	91.6	76.1	95.0
Hassle switching seed during planting	4.0	2.5	6.8	5.0
Can't be bothered/not important	2.8	0.0	8.6	0.0
Fields too small	2.8	2.5	3.7	0.0
Difficult to keep track of	1.6	1.3	1.8	5.0
Want to plant more BT corn	1.6	0.9	3.1	0.0
Fields too far apart	1.0	1.3	0.6	0.0
Hassle switching herbicides	1.0	1.6	0.0	0.0
Fields too large	0.2	0.0	0.6	0.0
Ran out of non-BT corn seed	0.2	0.3	0.0	0.0

Difficulties in Meeting Proximity Requirement - By Corn Acreage				
Difficulties	% of Bt Growers			
	Total	Small	Medium	Large
Base	503	258	139	106
No difficulty	86.7	85.7	87.1	88.7
Hassle switching seed during planting	4.0	3.9	5.8	1.9
Can't be bothered/not important	2.8	1.9	2.2	5.7
Fields too small	2.8	2.7	3.6	1.9
Difficult to keep track of	1.6	2.3	1.4	0.0
Want to plant more BT corn	1.6	1.6	0.7	2.8
Fields too far apart	1.0	1.2	1.4	0.0
Hassle switching herbicides	1.0	1.2	1.4	0.0
Fields too large	0.2	0.0	0.0	0.9
Ran out of non-BT corn seed	0.2	0.4	0.0	0.0

The above tables examine the difficulties Bt corn growers are having in meeting the proximity requirement split by province and corn acreage category. Bt corn growers were asked an open-ended question on what difficulties they had in meeting the requirement to plant non-Bt corn in the same field or within ¼ mile of Bt corn. Responses are summarized in the tables and listed in order of most frequently mentioned. Differences between rows that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- 86.7% of Bt growers say they have no difficulties in meeting the proximity requirement.

Difficulties in Meeting 20% Refuge Requirement - By Corn Acreage				
Difficulties	% of Bt Growers			
	Total	Small	Medium	Large
Base	505	261	141	103
No difficulty	85.4	84.7	85.8	86.4
Hassle switching seed during planting	3.4	3.5	3.6	2.9
Can't be bothered/not important	3.2	3.8	0.7	4.9
Difficult to keep track of	2.8	1.9	5.7	1.0
Fields too small	2.8	3.1	2.8	1.9
Want to plant more BT corn	1.6	1.9	1.4	1.0
Ran out of non-BT corn seed	0.8	1.2	0.7	0.0
Fields too far apart	0.4	0.4	0.7	0.0
Hassle switching herbicides	0.4	0.4	0.0	1.0
Fields too large	0.2	0.0	0.0	1.0

The above tables examine the difficulties Bt corn growers are having in meeting the 20% refuge requirement split by province and corn acreage category. Bt corn growers were asked an open-ended question on what difficulties they had in meeting the requirement to plant at least 20% of their corn acres to non-Bt corn. Responses are summarized in the table and listed in order of most frequently mentioned. Differences between rows that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- 85.4% of Bt growers say they have no difficulties in meeting the 20% refuge requirements.
- Although only a low proportion of Bt growers mentioned difficulties, the most frequent mentions were hassle switching seed during planting, can't be bothered or consider the requirement unimportant, find it difficult to keep track of and fields being too small.

By Province:

- A significantly higher proportion of Bt growers in Ontario had mentioned no difficulties in meeting the 20% refuge requirement.
- A significantly higher proportion of Bt growers in Quebec said meeting the requirement was unimportant or they could not be bothered meeting it.

By Corn Acreage Category:

- No significant differences based on the size of corn grower are evident.

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Difficulties in Meeting Proximity Requirement - By Province				
Difficulties	% of Bt Growers			
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No difficulty	86.7	91.6	76.1	95.0
Hassle switching seed during planting	4.0	2.5	6.8	5.0
Can't be bothered/not important	2.8	0.0	8.6	0.0
Fields too small	2.8	2.5	3.7	0.0
Difficult to keep track of	1.6	1.3	1.8	5.0
Want to plant more BT corn	1.6	0.9	3.1	0.0
Fields too far apart	1.0	1.3	0.6	0.0
Hassle switching herbicides	1.0	1.6	0.0	0.0
Fields too large	0.2	0.0	0.6	0.0
Ran out of non-BT corn seed	0.2	0.3	0.0	0.0

Difficulties in Meeting Proximity Requirement - By Corn Acreage				
Difficulties	% of Bt Growers			
	Total	Small	Medium	Large
Base	503	258	139	106
No difficulty	86.7	85.7	87.1	88.7
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Can't be bothered/not important	2.8	1.9	2.2	5.7
Fields too small	2.8	2.7	3.6	1.9
Difficult to keep track of	1.6	2.3	1.4	0.0
Want to plant more BT corn	1.6	1.6	0.7	2.8
Fields too far apart	1.0	1.2	1.4	0.0
Hassle switching herbicides	1.0	1.2	1.4	0.0
Fields too large	0.2	0.0	0.0	0.9
Ran out of non-BT corn seed	0.2	0.4	0.0	0.0

The above tables examine the difficulties Bt corn growers are having in meeting the proximity requirement split by province and corn acreage category. Bt corn growers were asked an open-ended question on what difficulties they had in meeting the requirement to plant non-Bt corn in the same field or within ¼ mile of Bt corn. Responses are summarized in the tables and listed in order of most frequently mentioned. Differences between rows that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- 86.7% of Bt growers say they have no difficulties in meeting the proximity requirement.

- Although only a low proportion of Bt growers mentioned difficulties, the most frequent mentions were hassle switching seed during planting, can't be bothered or consider the requirement unimportant, and fields being too small.

By Province:

- A significantly lower proportion of Bt growers in Quebec had mentioned no difficulties in meeting the 20% refuge requirement and a significantly higher proportion mentioned the requirement was unimportant or they could not be bothered meeting it.
- No other differences by province are significant.

By Corn Acreage Category:

- No significant differences based on the size of corn grower are evident.

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11. Suggestions to Improve Bt Corn Refuge Management

Suggestions to Improve Bt Refuge Management Program - By Province				
Suggestions for Improvement	**% of Bt Growers**			
	Total	**Ontario**	**Quebec**	**Manitoba**
Base	90	72	15	3
Lower cost	42.2	44.4	33.3	33.3
Ensure that requirements maintained	18.9	19.4	20.0	0.0
Educate farmers/provide more info	11.1	8.3	26.7	0.0
More varieties	7.8	8.3	0.0	33.3
Improve resistance	4.4	1.4	20.0	0.0
Affects crop rotation	4.4	5.6	0.0	0.0
Improve root worm resistance	3.3	4.2	0.0	0.0
Eliminate TUA	3.3	4.2	0.0	0.0
Eliminate need for non-Bt in program	3.3	4.2	0.0	0.0
Change seed/bag colour from non-Bt	2.2	1.4	0.0	33.3
Allow planting of more Bt	2.2	1.4	6.7	0.0
Non-Bt should not be strip-planted	2.2	2.8	0.0	0.0
Improve yield potential	1.1	1.4	0.0	0.0
Include 20% non-Bt in seed bag	1.1	1.4	0.0	0.0
Easier shelling corn	1.1	1.4	0.0	0.0

Suggestions to Improve Bt Refuge Management Program - By Corn Acreage				
Suggestions for Improvement	% of Bt Growers			
	Total	Small	Medium	Large
Base	90	43	32	15
Lower cost	42.2	39.5	43.8	46.7
Ensure that requirements maintained	18.9	20.9	18.8	13.3
Educate farmers/provide more info	11.1	9.3	12.5	13.3
More varieties	7.8	14.0	3.1	0.0
Improve resistance	4.4	0.0	9.4	6.7
Affects crop rotation	4.4	2.3	9.4	0.0
Improve root worm resistance	3.3	2.3	0.0	13.3
Eliminate TUA	3.3	4.7	3.1	0.0
Eliminate need for non-Bt in program	3.3	2.3	3.1	6.7
Change seed/bag colour from non-Bt	2.2	0.0	3.1	6.7
Allow planting of more Bt	2.2	4.7	0.0	0.0
Non-Bt should not be strip-planted	2.2	4.7	0.0	0.0
Improve yield potential	1.1	0.0	3.1	0.0
Include 20% non-Bt in seed bag	1.1	2.3	0.0	0.0
Easier shelling corn	1.1	0.0	3.1	0.0

The above tables provide suggestions for improvement in the Bt refuge management program from Bt corn growers split by province and corn acreage category. Bt corn growers were asked, in an open-ended question, for suggestions to improve the Bt refuge management program. The table provides a list of all suggestions listed in order of most frequently mentioned. Differences between columns that are statistically significant at the 90% confidence level are highlighted.

Summary Observations:

Overall Market:

- Only 90 Bt growers out of a sample of 528 or 17% could provide any suggestions for improvement.
- Of the suggestions for improvement directly related to refuge requirements the top two suggestions are lowering of costs, ensure the requirements are maintained and education or providing more information.

By Province:

- No significant differences by province are evident.

By Corn Acreage Category:

- No significant differences based on the size of corn grower are evident

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- Although only a low proportion of Bt growers mentioned difficulties, the most frequent mentions were hassle switching seed during planting, can't be bothered or consider the requirement unimportant, and fields being too small.

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Easier shelling corn	1.1	0.0	3.1	0.0

The above tables provide suggestions for improvement in the Bt refuge management program from Bt corn growers split by province and corn acreage category. Bt corn growers were asked, in an open-ended question, for suggestions to improve the Bt refuge management program. The table provides a list of all suggestions listed in order of most frequently mentioned. Differences between columns that are statistically significant at the 90% confidence level are highlighted.

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By Corn Acreage Category:

- No significant differences based on the size of corn grower are evident

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